Menlo Park Notebook #27 [N-79-02-14]

There are no dated entries in this notebook with the exception of one entry for February 12 (no year). The book probably dates from 1879. Many of the entries are by Henry M. McIntire. There are also some entries by Edison. Most of the book consists of notes by McIntire on mixtures of metal sulphides and stannic sulphides. There are also miscellaneous calculations, possibly on meters, and notes by Edison on chemical experiments and on experiments to produce a coal-like residue from vegetable substances. The book was paginated twice, from the front to the back (pp. 1-142) and from the back to the front (pp. 1-284). In the first sequence, all of the left-hand pages are unnumbered.

Blank pages not filmed [first sequence]: 42-47, 72-76, 80-141.

No 27

480
5560

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GENERAL ELECTRIC.

_____, 189 6

Antimony - Sb_2S_3

Arsenic, Dis - As_2S Realgar, Red Orpiment

" Fre - As_2S^3, Orpiment

Bismuth, Dis - Bi_2S^3

" Fre - Bi_2S^3

Copper = Proto - Cu_2S

" = Hemi - Cu_2S

Iron - Proto. FeS.

" magnetic, Fe_3S_4

" disulph - FeS_2

Potassium, Dis - K_2S_2, (alkali)

" Tetra

Sodium Dis

Tri -

Tin, proto. SnS

" disulph. SnS_2

Zinc - sulphide

Phosphorus, sulphide

Mixtures of Sulphides

Equal Parts of —

1 Sulphide " Antimony
" " Bismuth

2 " " Antimony
" " Cobalt

3 " " Antimony
" " Iron

4 " " Antimony
" " Potassium

5 " " Antimony
" " Sodium

6 " " Antimony
" " Tin

7 " " Antimony
" " Zinc

8 " " Antimony
" " Lead

9 " " Antimony
" " Arsenic

Lang & Wright

Equal Parts of ——

10 Sulphides of Arsenic
—— Bismuth

11 —— Arsenic
—— Carbon

12 —— Arsenic
—— Iron

13 —— Arsenic
—— Lead

14 —— Arsenic
—— Potassium

15 —— Arsenic
—— Sodium

16 —— Arsenic
—— Tin

17 —— Arsenic
—— Zinc

Hand Alternative

MIXTURE of SULPHIDES.

Equal Parts of

18 Sulphide of Bismuth
Copper

19 Bismuth
Iron

20 Bismuth
Potassium

21 Bismuth
Sodium

22 Bismuth
Tin

23 Bismuth
Zinc

24 Bismuth
Lead

Bismuth

MIXTURE of SULPHIDES.

Equal Parts of –

25 Sulphide of Cobber
——— Iron

26 ——— Cobber
——— Lead

27 ——— Cobber
——— Potassium

28 ——— Cobber
——— Sodium

29 ——— Cobber
——— Tin

30 ——— Cobber
——— Zinc

Newly Mixture

MIXTURES of SULPHIDES

Equal Parts of

31 Sulphide of Iron
——— — Lead

32 ——— — Iron
——— — Phosphorus

33 ——— — Iron
——— — Sodium

34 ——— — Iron
——— — Tin

35 ——— — Iron
——— — Zinc

Mag. Mechanics

MIXTURES OF SULPHIDES

36 Equal Parts of
Sulphide of Lead
" Potassium

" " Lead
37 " " Sodium

" " Lead
38 " " Iron

" " Lead
39 " " Zinc

Exp. Sulphides

MIXTURES OF SULPHIDES

Equal Parts of

No	Sulphide of	Potassium	
	"	"	Sodium
	"	"	Potassium
41	"	"	Tin
	"	"	Potassium
42	"	"	Zinc

MIXTURES OF SULPHIDES

Equal Parts of

43 Sulphide of Sodium
" Tin

46 " " Sodium
" " Tin

45 Sulphide of ~~Sodium~~ Tin
" " Zinc

~~Sulphide of Tin~~

MIXTURES OF SULPHIDES

Equal Parts of

Sulphide of Earthrow.
" " Antimony
" " Phosphorus
" " Arsenic
" " Phosphorus
" " Bismuth
" " Phosphorus
" " Iron
" " Phosphorus
" " Copper
" " Phosphorus
" " Lead
" " Phosphorus
" " Potassium
" " Phosphorus
" " Sodium
" " Tin
" " Phosphorus
" " Phosphorus
" " Zinc

Joseph W. Wright

Stannic Sulphide. SnS_2 - To make,

1. Pots. chloride of tin + sulphur (mix not work)
2. Eq. pts. of sifted tin filings. S + NH4 Cl
3. 4 pts tin filings. 3 pts S, ~~4 pts S~~ 2 pts NH4 Cl.
4. A pulverized amalgam in 19 pts Sn + 6 pts Hg. with 7 pts S, and 6 pts NH4Cl.
5. A pulverized amalgam of 12 pts Sn + 3 pts Hg mix 7 pts. S + 3 pts NH4 Cl
6. 2 pts SnO_2 + 1 pt S
7. 8 pts SnO_2 + 4 pts. S + 4 pts NH4 Cl
8. 10 pts SnS + 5 pts S + 4 pts NH4 Cl
9. 5 pts SnS + 1 pt $SnCl_2$ + 2 pts S
10. 5 pts SnS + 8 pts HgCl2

Either of these mixtures gently heated to redness in a glass retort or a strongly covered crucible, immersed in a sand bath. Vapors of mercury, sal. ammoniac &c are driven off, afterwards the excess of sulphur which the Stannic sulphide partly remains ~~[illegible]~~ at the bottom of the vessel, and partly collects in the sublimate particles persists, as a sublimate -

Watts. Vol V of Fes

Sulphides of the following Metals to be tried.

Aluminium
Antimony
Arsenic
Barium
Bismuth
Boron
Cadmium (?)
~~Cerium~~ ?
Calcium
Cerium (?)
Chromium
Cobalt
Columbium
Copper
Didymium ?
Magnesium
Manganese
Nickel
Phosphorus
Selenium
Sodium
Strontium
Tellurium

Tin
Titanium
Tungsten
Zinc

Henry Middleton

Pt. Stannic Sulphide

As to its forming: not Red Lamb

Heated a small portion in a Porcelain Crucible, minute red = decomposed.

Heated a small portion in a Porcelain crucible not red. Engaged

Heated a small portion in a Porcelain Crucible not red. Lighted not [illegible]

Heated a small portion in a [illegible] not red, no good.

Heated a portion in a Crucible with red hot lighted one. (15 min). No [illegible] [illegible]

Repeated - (20 ") - Not twice, by [illegible]

Repeated - (25 ") Not twice

Repeated - (30)

Heated with Sulphur, in Crucible (30 min) Not long enough.

Heated in Crucible, (30 min) Not Fused

" " "

Stannic Sulphide. Henry McCutcheon

To Fuse

In Hessian Crucible in furnace,

Heated sample above in Hessian crucible 10 minutes. Lid came off. Found ~~Heated Sample above in Hessian crucible 10 minutes~~ However about half of it fused to button unaltered; and remainder above, having been semi-fused, but had partly decorrepted. Does not know how long the lid was off. Removed from fire as soon as discovered.

Heated Sample in Hessian (like-lutted) same as above, for 10 minutes. Found contents about same as above. For fuse the time = 20 minutes.

Stannic Sulphide

To Ferric — Hydrate & Ferric

Heated in Hessian Crucible same as above 30 minutes. Found mass fused, and but a small coating of black stuff (S.S.) Fry Ferric Ferric

Heated in Hessian Crucible ~~same as~~ at same as above with addition of small quantity of pulverized Sulphur Lid off 15 minutes, formed a slate gray mass, Fry mass mass

Heated in Hessian Crucible, alone, Bloody lid came off... Fry again

Found it's in a bottom b/c dark unfused.

Heated in Hessian Crucible with Sulphur (less than before), 15 minutes Black mass, semi-fused, with light gray ash Fry again with but trace of S.

Stannic Sulphide

Heavy Yellow Solid

Heated in Hessian Crucible, about 30 minutes

Most amount of fused Sulphide, upon turned out. Dry crucible for an hour.

Heated in a Hessian Crucible with a lump of Sulphur,

20 minutes.

Found that a very small portion of the fused Sulphide, and a large amount of the Sulphide mass, also, a few minute yellowish of cubic crystals [illegible] somewhat very [illegible]

Sulphur - had a very small amount of metallic Sn

[illegible] = Salt [illegible] =

Brown fumes = microscopic salts [illegible]

carbonate = caustic soda. [illegible] expand

Stannic Sulphur

Henry Wilkerson

SnS_2

1 of Tin and .5814 Sulphur

$SnS + S = SnS_2$

$(M_2 132) - 32 =$

$144 \div 32 =$

$1 \div .222 =$

To MAKE

4 grms - SnS
.88 - S
} mixed well, placed in Hessian crucible, and in fire, Lute Brooks

Crucible Water

Repeated

Repeated

Stannic Sulphide

Haughton Institute

Fusing of

In Crucible, with salt cover.

Not Good

In crucible with borax cover

Quite good button

~~Very~~ Fragile

In Crucible with microcosmic salt

Lil Flow of

do. with Sodium Carbonate

Not Good

do with Potassic Cyanide

Very good, big button, and comfortable

with borax by taking equal weights of SnS2 and weigh the resulting button, one

Large button equal

Stannic Sulphide

1. Conc. Sol. Stannic

To Mark.

Fried, 5.5+5 over Bunsen Burner, fused, M.P. slumped to dirty, blackish yellow, the bottom apparently unaltered. Put back in crucible & heated again for two hours over blast lamp. No change

altered

Fused in Berlin crucible with lid on cover. over Bunsen burner & left attached. Put back over a blast lamp, after some heating found several bunches of crystals of the disulphide, after the M.P. and at the bottom a solid layer of the monosulphide, in lamminae, resembling to a great extent graphite, would mark paper

Stannic Sulphide

Henry McCrosson

To Flask

Fused 40 gms Sn. 23 gms Sulphur in crucible over Bunsen burner.

Found mass did not change to black sulphide

Fused SnS + S over Bunsen Flask lamp. Found a sublimate in the of SnS, in flat, transluscent yellow crystals & some black of flask, some brownish yellow of SnS, and in the bottom a fused crystalline mass of both. They equal weights of S + Sn

Fused SnS + S + Borax Glass over Flask lamp found a black slag, and a [illegible] of Sulphide & tin

Fused SnS + S and KO, over Flask lamp Quantity of the black, was not over

Fused SnS + S (equal weights) small sublimate of SnS

Stannic Sulphide

Henry Wilkinson

Fract. $SnS + S + HCl$ over Blast lamp
Found quite an amount changed to
SnS_2 in loco, tested as on a
and put back. Still larger yield
only a small remainder of Stannous
Sulphide.

Stannous Sulphide and sodic sulphide
No good

Fract $SnS_2 S + HCl$ over blast lamp
Not quite so good yield as the
previous one. The crucible used was
much larger, consequently [illegible]
frying a crucible full up to the brim

Fract $SnS + S + HCl$,
Slight amount formed, try again with
less Sulphur

Stannic Sulphide

Henry Williams

Fused in Crucible over Blast-lamp with
3 gms. SnS, 3 gms. S, 15 Hce
Pow. Pow. Pow

Fused SnS + S + KHO Cl, in a
crucible that was completely filled.
Got a yield, although fused mass
contained a smaller sulphide a bottom.
Had Probability, Production of
Chemicals not correct

Fused SnS + S + KHO Cl over Bunsen burner.
Very fine fused, then a gas tube [illegible]
in sub. put over Bunsen Blast
Oxidised, Overheat

Fused. - 5 gms. SnS + 2.5 S + 2. Hce -
Slip Slip,
A small amount of unaltered sulphide
a bottom

Stamm Syphilis

Hemorrhagic Urticaria

Trip 5 gm Sw + 2.5 S + 4 Nitro cc

Not improved

Trip 5 gm. Sn S + 2.5 S + 1 Nitro cc

Nitrony goods try metal with mark

Nitro cc.

Trip 5 gm Sn S + 2.5 S + 2 Nitro cc

Nitrony goods, try again.

Trip 5 gm Sn S + 1/2 S + 2 Nitro cc

Try 5 gm Sn S + 2.5 S + 2 Nitro cc

Stannic Sulphide

Hempel's Method

Tried mixture 0.5gms S.S + 2½gms + 2gms KClO3 in a long glass tube ~~open~~ closed at lower end and capped with porcelain crucible, placed on sand bath and heated slowly.

Fused down mass in a steel ladle at one end, and cooled with porcelain crucible, and heated directly by Bunsen burner.

Found at bottom, a mixture of black + yellow sulphides, above this a deposit of $HgCl_2$ + some yellow sulphur, and above this sublimate

Stannic Sulphide

Henry McCarthy

Fused in Berlin Porcelain crucible some 5 gms Sn S2 2½ gms S2 2 gms HgCl, heated red and heated directly over Bunsen Burner.

Found it pretty completely changed to Stannic Sulphide. Of this took 3 gms and added 1 gm. Sulphur and 1 gm. Ammonic Chloride mixed well, placed in Porcelain crucible, heated hot and placed over Bunsen lamp

Brit. 2.5 gms Sulphur in bottom of crucible, above it, an intimate mixture of 5 gms Sn S and 2 gms HgCl, in a porcelain crucible over Bunsen Lamp

Not at all good

Stannic Sulphide

Stannic Sulphide

Fused in crucible, 5 gms SnS_2 + 3 gms S, + 2 gms. Nitrate, fused. over Bunsen Burner.

Retrieved, repeat (and gave more heat) repeatedly with Bunsen, and more with blast, try also 2 gms Sulphur, with Bunsen and with blast, try 2.5 gms Sulphur, more Bunsen and more blast

Stannic Sulphide,
Howard McIntosh

Fired in Crucible (#1), 5 gms. Sn S + 3 gms S + 2 gms NH4Cl, over Bunsen
Gas's about as usual. The usual stain of metallic sulphide in that part of the crucible that was received the most heat

Fired in Crucible (#2) 5 gms Sn S + 3 gms S + 2 gms NH4Cl over blast
Found the Sn S above and the S-S below in a fused mass, by one run Bunsen and then over blast

Fired in crucible (#3) 5 gms Sn S + 2.5 gms S + 2 gms NH4Cl, over Bunsen
Better better than ~~all~~ altho the same was recommended Zero may be observed, Scrape the off and try it with heat, then of more convenient distinction that would be any better

2 : 4

1 : 4 :: 9 : X

36

2 : 4 :: 5 : 18

2

4)18
4 2/4

6
4
1 1/2
3
4 1/2

4)12.6
3 1/2
3
9 4 1/2
12 2
9.5

4)22.0
5.5
3
165
15.5
10

4)36
56.5
3
169.5
186
19.5

Stannic Sulphide

Henry M. McIntosh

Fried in crucible (#3) .5gms. Sn S + 2.5 S + 2 NH4 Cl over Bunsen

Fried in crucible (#4) .5gms Sn S + 2.5gms S + 2 NH4 Cl over blast. Pretty very small yield, the same relation as #2. Seems evident that the amount of S should vary with the heat. Try mix #4 S + 2 NH4 Cl also #5 + NH4 Cl

Fried in crucible (#5) .5gms Sn S + 2gms S + 2 NH4 Cl over Bunsen, placed in a larger crucible, the outside being filled with sand. Yield not near as good but much more uniform.

Fried in crucible (#6) .5gms Sn S + 2gms S + 2 NH4 Cl over blast

Pretty fair, but a great amount of Sn S separated

Stannic Sulphide

Hemp Miller's method

Tried. SnS - 5gms, SH_2 9gms. + HCl cc. 2gms placed in ~~small sand bath and over blast~~ over blast. Same

Not remarkable.

Tried SnS. 5gms, SO_2 5gms, HCl cc. 2gms. placed in small sand bath and over Bunsen burner.

About as usual.

Obs. – to reduce stannic sulphate by C.
– to form SnS_2 by passing H_2S over red hot
– to form SnS_2 by $SnCl_4 + S$
– to " " " by passing H_2S over SnO

Stannic Sulphide

Heavy black solution

Tried 1 of Sn, 1 of S, 1 of NH_4Cl, well mixed, and heated very small quantity taken and

Tried 4 of Sn, 3 of S, 2 of NH_4Cl.
Smaller quantity, quickly about the same

Tried Equal weights of $SnCl_2$ and S.

BAKG up.

Completely transformed,
not for least amount of S.

\# 5.4 $SnCl_2$ + 1S =
2.2 $SnCl_2$ + 1 Sn.

Tried. $SnCl_2$. 5 gm. 1S
Most of it converted although there seems to be a little $SnCl_2$
Weight of product 1.8
Theoretical quant 2.4

J.E.T.

Stannic Sulphide
Hemisphidchloride

Used. 5gms. $SnCl_4$, 2gms S
Most of it churned up although the same the attempt charged.
Weight of product = 1.8

Theoretical yield of SnS_2 from 5gms $SnCl_4$ = 2.4gms

Used. 5gms $SnCl_4$ 2gms S.
Better than preceding.
Weight of yield 2.2

Used 5gms $SnCl_4$ 3gms S
About the same, perhaps a little better,
Weight of product. 2.2 (for a better lot)

Used 5gms $SnCl_4$ 4gms S
Better still.
Yield — 4.4 Sulphur not completely converted
Try again

XXX

Stannic Sulphide

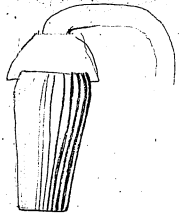
~~Heavy Mill Scales~~

Used. 5gms $SnCl_2$ - 5gms S.
Reduction
and 4.9 Sulphur not all fl

Used. 4gms $SnCl_2$ + 5gms
Partially reduced to black sulphide,
Heated to high out too long.

Used 3gms $SnCl_2$ + 5gms S
Almost completely to the
black sulphide

Used 2gms $SnCl_2$ + 5gms S



Stamina Sulphide

Henry M. Waterton

~~Iced 14gms Sulph + 5gms S.~~

Iced 5gms $SnCl_2$ + 14gms S.
Good but bottom, black

Iced 5gms $SnCl_2$ + 5gms S
Good, a little black, and sulphur
rotted of at top.

Iced 5gms $SnCl_2$ + 3gms S.

VERY
GOOD

112

Stannic Sulphide
Stannic Sulphide

Fried 5 gms $SnCl_2$ + 2 gms S.
Grott. 5 mm chloride, and 5 mm
black sulphide

Fried 5 gms $SnCl_2$ + 1 gm S.
Very good altho' a small
amount of sulphur, and a little
chloride

Fried 5 gms $SnCl_2$ + 1.5 gms Sulphur
Found tiny of sulphur

Fried 5 gms $SnCl_2$ + 1.5 gms Sulphur
Found tiny of sulphur,
Finished and put on Star Hand
— Found tiny crystals of sulphur
and little black sulphide

Stannic Sulphide

Having the blow pipe

Fused 5 gms Sn Cl4 1.5 gms S.
Green Flame, tip sulphur
Bottom Black Sulphide

Fused 5 gms Sn Cl4 1.5 gms S.
Started at air mass. No sub=
phur but some chloride.

Fused 5 gms Sn Cl4 + 2 gms S.
The sulphur being placed in
the bottom and the Sn Cl4 above it
Good at bottom (but the chloride)
Sulph. at top, by mistake less S.

Fused 5 gms Sn Cl4 + 1 gms S. (S. at bottom)
Still sulphurous odour, though
fused S. — 1/h

Fried 5 gms Sn Cl4, 5 gms S. The Sulphur
being at bottom. Strong heat
Too much Sulphur.
Try again with 2 gms S. A dark colored mass

Stannic Sulphide

Henry Millchatus

Tried. $SnCl_2$ (5gms) + S (2gms) Sulphur being at top and that which about half way up the side of crucible. No good

Tried. $SnCl_2$ (5gms) S. 2gms. Sulphur hung on bottom of crucible, Stannic Sulphide above it. Very quiet heat. Stannous Sulphide fused. Reheated at higher heat.

Dexter Good

Try $SnCl_2$ + S + NH_4Cl.

Tried. $SnCl_2$. 5gms. S. 2gms NH_4Cl. 2gms. very good, fuse back and heated higher

Tried $SnCl_2$ (5gms) S (2gms) and heated strongly, refused when higher

Not good for something

Tried $SnCl_2$ (5gms) S (2gms) NH_4Cl (2gms) - heated

Upset.

Samuel Smallpiece

Hiram McMinter

Fried 3gms Sulc. 3gms S and 3gms Nitr Ac
Removed from fire now they turn out the best and returned the rest to crucible & heated

Fried: Sulc + S,

~~[illegible]~~ RE

Fried 3gms Sulc, 3gms S. 3gms Nitr Ac.
VERY GOOD

NOTE. EXAMINED Some of earthy looking bottom ~~[illegible]~~ incrusation and found # Sulc Sulc. in a finely divided state
Examined and the very most little found

Stannic Sulphide
Hemisulphide

Ind Sulph 5. S 2.
Very fair.

Ind Sulph = 5. S = 1
very good

Ind Sulph (5gms) S (2gms) NH_4OH (2gms)
About as usual

Stannic Sulphide

Henry M. McIntosh

To Fuse.

Fused some in small hessian crucible in furnace, very hot for 11 min., 10.20 / 8.50

Ld cam ff. all volatilized

Bito – Bito Bito Bito Bito Bito

Sublimated found nothing but black 11.20

Sulphide

Bito Bito Bito Bito Bito Bito Bito Bito Bito

Nothing but black Sulphide 11.30 / 11.47

Bito Bito Bito Bito Bito Bito Bito Bito Bito

Nothing but black Sulphide 11.57 / 11.12

Bi. Bo. Bi. Bi. Bi. Bo. Bi. Bi. Bo. Bi. Bi.

Nothing but black Sulphide 11.20

Try more of the stuff and pack it hard in the crucible

Jannie Sutherland
Henry McKechnie
1.1.55

Issued Wall + Sun Lofts,

24) 3 8 6 (.0119
24
42
24
220
216

21) .0685 (.0326
63
55
42
130
126

21) .0652 (.0311
63
220
21
10,0

21) .0675 (.032
63
45
42

60) ~~.0082~~ (.00
~~.0005~~

~~.0320~~
320 (.0005

Weighing to be done

~~Grand b, 7.445 P.M.~~

~~b-end f, 10, 11, 12, 13, 14, 15 = 12.00.~~

~~7, 8, 9 = 8.30 P.M.~~

~~1, 2, 3, 4, 5, 12.00.~~

~~a, b, c, e, 3.30 P.M.~~

a = 5.1718
b = 5.3552
c = 5.0855

5.1555
1.1555
4.
24
96

g = 14.1355
h = 14.3372
~~8.15 P.M.~~

7 = 14.4550
8 = 7.236
9 = 3.791
~~8.30~~

1 = 15.2350
1 = 13.4877
2 = 15.9400
2 = 14.2911
3 = 15.7738
3 = 15.3330

1 = 28.430 –
2 = 29.245 +
3 = 27.868
~~10 = 10.310~~
~~11 = 5.535~~
~~12 = 3.200 +~~
~~13 = 7.631~~
~~14 = 4.076~~
~~15 = 9.268~~
d = 18.359
e = 4.098 +
f = 5.695 +

~~12.30 P.M.~~

18.407
18.392
.015

4.720
4.714
.006

5.713
5.707
.006

18.771
18.716
.055

4.795
4.774
.021

5.772
5.795
.0225

18.392
18.359
.033

4.714
4.698 +
.016 –

5.707
5.695 +
.012

surface oxidizes very much

5.199
5.178
.021

5.376
5.352
.024

5.113
5.085
.028

21) 96 (4.57
84
12.0
105
15.0
147
3

5.399
5.199
.200

31.155
27.205
3.[illegible]

96) 21.0 (.219
192
18.0
96
84.0

1.[illegible]4 = 1.74

5.208
5.199
43) .0090 (209
86
400

5.220
5.208
72) .0120 (166
72
48.0
432
48.0

15.250 = 15.262 − x − y
13.487 = 13.488 + x − y
1.763 = 1.774 − 2x
1.763
2x = .011
x = .0055 — 1

15.996 = 16.007 − x − y
14.201 = 14.206 + x − y
1.795 = 1.801 − 2x
1.795
2x = .006
= .003 — 2

15.738 = 15.749 − x − y
15.330 = 15.333 + x − y
.408 = .396 − 2x
396
.012 = 2x
x = .006 — 3

15.250 + 13.487 = 28.737
15.262 + 13.488 = 28.750
28.750 − 28.737 = .013

15.996 + 14.201 = 30.197
16.007 + 14.206 = 30.213
30.213 − 30.197 = .016

15.738 + 15.330 = 31.068
15.749 + 15.333 = 31.082
31.082 − 31.068 = .014

18.413	13.877	13.897
14.458	14.161	14.440
29.871	29.848	30.337
29.848		30.312
.023		.025

14.145	
30.312	

13.560	15.200
14.225	13.563
28.785	28.763
28.763	
.022	

1 = 28.405 – 1.50 RU. 7th
2 = 29.898 – 1.55
3 = 27.848 – 2
4 = 10.978 – 2.05
5 = 5.540 – 2.10
6 = 3.188 – 2.15
7 = 7.620 – 2.20
8 = 4.067 – 2.25
9 = 2.261 – 2.30
a = 18.335 – 2.35
c = 4.685 – 2.40
f = 5.685 – 2.45
a = 5.169 – 3.30
b = 5.338 – 3.35
c = 5.071 – 3.40

9 = 14.121 – 7.45 RU.
h = 14.365 – 7.50

7 = 14.422 – 8.30 RU.
8 = 7.217 – 8.35
9 = 3.768 – 8.40

7.631	10.310	14.450
7.620	10.278	14.422
.021	.032	.028

4.076	5.545	7.236
4.067	5.540	7.217
.009	.005	.019

2.268	3.200	3.791
2.261	3.188	3.768
.007	.012	.023

5.178	5.352	5.085
5.169	5.338	5.071
.009	.014	.014

14.135	14.372	
14.121	14.365	
.014	.007	

18.335	4.698	5.695
18.335	4.685	5.685
.024	.013	.010

195) .00 6 5 0 (.00282
3 9 0
1 0 0 0
1 3 6 0
4 0 0
3 9 0
1 0

0119
0118
2) 237
.01188

195) .00 3 0 7 (.001 5 3
1 9 5
1 0 5 0
9 7 5
7 5 0
3 9 5
1 7 5

195) .00 6 8 0 (.00 3 0 7
8 8 5
1 5 0 0
1 3 6 5
1 3 5

4.0 2 2 0
3.3 3

.196) .00 1 9 8 (.0101
.196
2.0 0
1 9 6
4 0

2 2 0 0) 3 7 8 5 0 (17.2
2 2 0 0
1 5 8 5 0
1 5 4 0 0
4 0 0 0
3 4 0 0

600) 3 7 8 5 0 (63.
3 6 0 0
1 8 0 0
1 8 0 0

24) .01185 (.0049375
9 6
2 2 5
2 1 6
9 0
7 2
1 8 0
1 6 8
1 2 0
1 2 0

63) .00049375 (.00788
4 4 1
5 2 7
5 0 4
2 3

63) .01185 (.00288
1 8
5 3 5
5 0 4
5 1 0

.000282
.000304
2) .000586
.000294

3.3 3) .01185 (.0036
9 9 9
1 8 6 0
1 6 6 5
1 9 5 0
1 9 9 8

.714

~~7 .30~~
~~2. 14.35~~
~~4. 9.55~~
.... 54
11.30
14.35
26.05

7. 14.35
2. 1 2.30
5. 2.05
12
60
2.05
62.05

Resistance cell = 2 Volts
Divide volts by resistance in
ohms, and the quotient will
be the amount in Webers
which pass

$$\frac{V}{R} = W$$

.002

.002 : 1 :: 2.31 : X

.002) 2.31 (1.155
2
3
2
11
10
10
10

1.155

7 . 15 . 30
2 . 15 . 30
5 . 0 . 0
12
60

7 . 19 . 45
2 . 20 . 15
4 . 23 . 30
12
48
23 . 30
71 . 30

1 = 28.391 − 1.50 ordinary
2 = 29.211 − 1.55
3 = 27.829 ± 2.
10 = 10.267
11 = 5.527
12 = 3.178
13 = 7.613 ordinary
14 = 4.061 clean
15 = 2.255 "

~~15.336 = 15.336 + x − 4~~
~~15.193 = 15.147 − x − 4~~
~~.142 = .188 + 2x~~

15.336 = 15.336 + x − 4
15.147 = 15.193 − x − 4
.188 = .142 + 2x
.046 = 2x
x = .023

1

~~15.462 = 15.458 + x − 4~~
~~14.844 = 14.799 − x − 4~~
~~.618 = .654~~

~~15.462 = 15.458 + x − 4~~
~~14.799 = 14.847 − x − 4~~
~~.683 = .611 + 2x~~
~~.072 = 2x~~
~~x = .036~~

15.458 = 15.462 + x − 4
14.799 = 14.847 − x − 4
.659 = .676 + 2x
.044 = 2x
x = .022

2

14.923 = 14.969 − x − 4
15.243 = 15.202 + x − 4
.318 = .283 + 2x
.035 = 2x
x = .0175

3

11.410 = 11.421 + x − 4
11.313 = 11.365 − x − 4
.097 = .056 + 2x
.041
.040 = 2x
x = .020

4

11.918 = 11.969 + x − 4
11.408 = 11.413 + x − 4
.510 = .556 − 2x
.510
2x = .046
x = .023

5

7
30
6
43

20
23
23
22
4)88

43) .02220 (.0005
215
5.00
43
7

.00051 gram per hour

12600) 6.00000 (.00048
50400
9600.0

.00051 : x :: .00048 : 1

.00048) .00051 (1.06
48
3.00
288

12
15
9
12
12
12
12
12
12
27
21
12
14
61
72

14 — 9 Run.
20 — 9 Run. — 15
20 — 12 Run. — 9
21 — 9 Run. — 12
21 — 9 Run. — 12
22 — 9 Run. — 12
22 — 9 Run. — 12
23 — 9 Run. — 12
23 — 9 Run. — 12
24 — 9 Run. — 27
25 — 12 Run. — 108
29 — 12 Run. — ~~96~~ 72
Feb. 1 — 12 Run.

12 — 12
15 — 14
9 — 4
12 — 5
2 12 — 5
3 12 — 10
4 12 — 5
5 12 — 7
6 12 — 6
27 — 10
108 — 59
~~96~~ 72 — 37
174

14 — 9 Run. — 27
20 — 12 Run. — 33
22 — 9 Run. — 24
23 — 9 Run. — 24
24 — 9 Run. — 27
25 — 12 Run. — 108
29 — 12 Run. — ~~96~~ 72

~~12~~ 3

12 — 13
15 — 8
9 — 5
12 — 4
12 — 4
12 — 6
12 — ~~10~~ 5
12 — ~~6~~ 5
12 — 6
27 — 8
108 — 39
~~96~~ 72 — 26

3

27 — 21
33 — 12
24 — 12
24 — 6
27 — 9
108 — 43
~~96~~ 72 — 26

19 — 9 P.M. — 27 — 28
20 — 12 P.M. — 33 — 14
22 — 9 A.M. — 24 — 13
23 — 9 A.M. — 24 — 9
24 — 9 A.M. — 27 — 10
25 — 12 M. — 108 — 52
29 — 12 P.M. — 34
Feb. 1 — 12 P.M.

19 — 9 P.M. — 96 — 28 × 16 = 4 — 24 × 6 = 144
23 — 9 P.M. — 147 — 3 — 147
29 — 12 P.M. — 72
Feb. 1 — 12 P.M.

22.11
20.15
1.20

2 1/16 × 1 1/32

572) 1089 (2 — 126
1024
65.0
1380
1024
356.0
3072
480.0

413 — 400 — 392 — 387 — 60
400 — 392 — 387 — 383
13 — 8 — 5 — 4

383 — 379 — 373 — 368
379 — 373 — 368 — 363
4 — 6 — 5 — 5

368 — 367 — 349 — 310
367 — 348 — 310 — 284
6 — 8 — 39 — 26

1030 — 1009 — 997 — 985
1009 — 997 — 985 — 979
21 — 12 — 12 — 6

979 — 970 — 927
970 — 927 — 901
9 — 43 — 26

126 — 096 — 082 — 069 — 060
096 — 082 — 069 — 060 — 050
29 — 14 — 13 — 9 — 10

050 — 998
998 — 964
52 — 34

33/16 × 33/32
33
33
99
99
1089
512

33
32
512
32
512

377 Mllgr

60

104 | 22.6 20 | 2.17

208

182

104

780

21.7 Mllgr in a

Second Daniells on Ohm

108 | 21.7 | 20.6

216

100

20. Mllgr per Weber

per second

20 Mllgr

252 | 5.57 | 2.176

5.12

450

256

1940

1764

1280 1760

1536

16.167
15.897
.280

15.200
14.925
.275
.18

15.687
15.413
274

15.

207
145
62

749
687
62

+88

125
20 60

65

33
17
231
33
561

15.335
11
15.324

15.335
15.335

17
5

33
32
1
256

1 1/32 × 2 1/8

21.708 2d 1.843 6.30

.00282
.00304
.00586
2).00299

2200) 6.0000 (.0024 Weber
4400
16000
13400

.00299 : x :: .0027 : 1

.0027).00299 (.11
27
25
27

31500) 6.0000 (.00016
31500
22500
22680

.00299 : x :: .00016 : 1

.00016).00299 (1.87
16
139
128
110
112

1 = 28,370 — 7.50 — Opaque white
2 = 29,185 — 7,05 — smell
3 = 27,802 — 7,00 — clear
7 = 14,377 — 7,15
8 = 7,184 — 7,25 — Op.
9 = 3,750 — 7,30 — slightly op.
10 = 10,237 — 7,40 — clear
11 = 5,507 — 7,45 — "
12 = 3,163 — 7,50 — "
13 = 7,604 — 9 — Op.
14 = 4,049 — 9,05 — clear
15 = 2,246 — 9,10 — "
a = 5,145 — 9,15 — "
b = 5,309 — 9,20 — "
c = 8,042 — 9,25 — "
d = 18,288 — 9,30 — slightly op.
e = 4,653 — 9,35 — clear
f = 5,870 — 9,40 — Op.
g = 14,082 — 9,45 — clear
h = 14,327 — 9,50 — "

Feb. 12 —

15
24
43

1- 12 - 19 - 50
7 - 13 - 50
5 - 5 - 10 = 125.10

7 12 - 19. 15
7. 20. 30
4 - 22. 45 = 119.45
24
96

13 12 - 21 - 50
7 - 14 - 20
5 - 6 . 40 = 126.40

19.5
60
1.170

a - 12 - 21 - 45
7 - 15 - 30
5 - 5 . 45
24
120+5 + 45 = 125.45

d 12 - 21 - 30
7 - 14 - 35
5 - 6 - 55
126 - 55

g 12. 21 - 45
7. 19. 45
5 - 2 - 50
122 -

32.24
29.24
3.00
24
72

43) .0230 (.0005-35
215-
15.0
129
21.0

43) .0220 (.000571
215-
5.0
43
7.0

43) .0180 (.000419
172
8.0
43
37.0

43) .02000 (.000465
172
28.0
258
32.0

23
22
18
20
23
5) 1105
215

43) .0215 (.0005-
215-

25-12
24.9
.3

13650) 6.0000 (.00047
5 6500.0
8820

.000 5 : X : : .000 47 : 1

.000 47) .000 5.0 (1.07
47
3.00
329

60) 1.07 (1.8 gr = 18. milligr.
60
47.0
480

.00047) .000 5.10 (
47
40.0
376

60) 108 (18
60
48.0
480

645-
370
.275-

413
185-
24) 228
216

12
15-
9
12
12
12
12
12
12
27
108
72
84
49.50
125:10
875

1+2

640-
633
12

633
619
14

619
615-
04

675-
610
5-

610
605-
05-

605-
595-
10

595-
580
5-

590
583
7

583
577
6

577
567
10

567
558
9

558
471
37

471
430
41

430
405-
25-

405-
370
35-

29 24
23.12
4-12

5.12
1.24
3-12

7.13.60
5.12
2 1 1.5.0

12 15
7.13.60
5 5.10

413 400 392 384 383 383 379
13 8 5 4 4 6

373 368 363 357 349 310 284
368 363 357 349 310 284 245
5 5 6 8 39 26 39

245 228
228 185
17 43

20.24
19.21
1.3

22.9
20.24
1.9

27
33
24
24
24
27
108
72

23.9
22.9
1.0

32.24
29.24
3.60

25.12
24.9
1.3

29.24
25.12
4.12

30 09 997
09 997 985
21 12 12

985
979
6

979 970
970 927
9 43

927
901
26

126
096
29

96 82 69 60 450 998
82 69 60 450 998 964
14 13 9 10 52 34

5.12
1.24
3.12

7.14
2.2
5.12

13.19
7.12
2.2

901 868
868 848
33 20

848
802
46

23.21
19.21
4.00

29 34
23.21
6.3

24 32.24
9 29.24
144 3

801 750 750 726 688
750 726 688 64 38
61 34 64 38

5.72
5.2
28

5.72
2.38
14

100
26
74

26
943
83

26
24.9
2

26.9
5.12
.21

27.
26.
.14

21 29 24
27.11
9.13

48
13
61

349 340
340 335
9 5

567
542
12

542 546 538
546 538 508
6 8 30

335 328
328 310
7 18

970 962
962 957
8 5

957 949
949 924
8 22

924 897
897 29
13 8 7

22
678
24

$$r = \frac{339-14}{339-2.5}$$

325
336.5

325)323.00(.9361
312.5
1210.0
1075
2050.0
2019.0
360.0

.9361
7310
7860
3930
1170
12.26 2910

13.10
.9361
7310
7860
3930
1170
12.26 2910

17.11.35
12.19.
4.15.35

17.11.15
12.19.40
4.15.35

17.12
12.19.15
4.16.45

17.11.45
12.21.45
4.14.45

15.335
15.193
.142

15.335
15.147
.188
.142
.46

Plate 3x1½

15.462
14.847
.615

15.485
14.799
.685

15.193
15.147
.46

15.262
14.969
.283

15.243
14.925
.318
.283
.035

15.335 = 15.335 + X − 4
15.147 = 15.193 − X − 4
30.482 = 30.528 − 24
30.482

24 = .046
7 = .023

15.335 = 15.335 + X − .023
15.147 = 15.193 − X − .023
.33
.023

1=28.333	10.30	Cl	Clear
2=29.144	10.40	"	Slight
3=27.766	10.45	"	clear
7=14.361	10.50	"	Ot
8=7.142	10.55	"	Slight
9=3.724	11.	"	"
10=10.197	11.15	"	Clear
11=9.476	11.20	"	Slight
12=3.143	11.25	"	"
13=7.590	11.45	"	Ot
14=4.034	11.50	"	Slight
15=9.233	11.55	"	"
a=5.128	12 Bl.	"	"
b=5.288	12.05 Bl.	"	Clear
c=5.018	12.10 "	"	Slight
d=18.270	12.15 "	"	Ot
e=4.655	12.20 "	"	Clear
f=5.658	12.25 "	"	Ot
h=14.299	12.30 "	"	Pink Ot

17−

15.252
14.969
30.221
30.168
.053

15.243
14.622
30.[illegible]

11.421
11.365-
22.786
22.723
.063

11.410
11.313
22.723

15.462
14.847
30.309
30.257
.052

15.458
14.799
30.257

11.969
11.413
23.382
23.326
.056

11.918
11.408
23.326

15.335-
15.153
30.528
30.482
.046

15.335-
15.147
30.482

11.410 = 11.421 + x - 4
11.313 = 11.365 - x - 4
22.723 = 22.486 - 24
22.723
= .063

15.243
.018
15.225+4
15.252
.027

14.925-
.018
14.943
14.969
.026

No. 3

~~11.410~~
~~.020~~
0

11.410
.020
11.390+4
11.421
.031

11.313
.020
11.333+4
11.365-
.032

No. 4

11.408
.023
11.385+4
11.413
.028

11.918
.023
11.941+4
11.969
.028

No 5

15.335-
.023
15.312+4
15.335-
.023

15.147
.023
15.170+4
15.193
.023

No. 1

15.458
.022
15.436+4
15.462
.026

14.799
.022
14.821+4
14.847
.026

No. 2

15.336-
.023
15.358

15.170
.023
15.147

No. 1

15.193
.023
15.170

.123 .022 .018 .020 .023 5)1.06 .022	15.335 .023 15.358 15.193 .023 15.170 15.147 .023	No. 1
15.462 .022 15.484 .458 .026	14.847 .022 .825 .799 .026	No. 2
15.252 .018 .270 .243 .027	14.969 .018 .951 .925 .026	No. 3
11.421 .020 .441 .410 .031	11.365 .020 .345 .313 .032	No 4
11.469 .023 .448 .428 .028	11.413 .023 .436 .408 .028	No. 5

15.252 .022 15.274	14.969 .022 14.947	15.252 14.969 .283 [redacted]	15.274 14.947 .327 .283 .044
15.252 14.969 .283	15.243 14.925 .318 .283 .035	No. 3	
11.969 11.413 .556	11.918 11.408 .510	556 510 .046	No. 5
11.969 .022 11.947	11.413 .022 11.435	11.969 11.413 11.356 .512 44	11.947 11.435 .512
15.458 14.799 .659 615 .044	15.462 14.847 .615	No. 2	
11.421 11.365 .056	11.410 11.313 .097 .056 .041	No 4.	

Average loss = 23
26
26
31
28
5) 134
27

27 in 72 hours from surface g.

Jan 28 - 11.05 P.M.
3
31

24) 72 (3
72

g
11
11
11
11
12
65

31. 19.30
28. 23.05
9. 20.25
24
48+20=68

29 loss in 69 hours from surface g.

$g = 14.218$; $g = 14.082$
$h = 14.462$; $h = 14.327$

14.218
14.082
.136

14.462
14.327
.135

$d = 18.771$; $e = 4.795$; $f = 5.772$
$" = 18.270$; $" = 4.655$; $" = 5.658$
.501 ; .140 ; .114

4
5.60

4
4.56
4.60
2) 10.16
5.08

3 : 12 :: x :

14.218
14.082
.135

14.462
14.327
.135

g
h
.1029

501
201
5.01

95.05
2510 01
3

12) 75.30 (2.49
24
6.30
6.30
2.49

40) 6.275 (2.51
4
22.7
22.0
5.00) 2.40
2.40
.00

40) 2.27
2.40
.170
.150
.020

3:12::K;

5.220	5.299	5.140
5.128	5.288	5.018
.092	.111	.122
7 14.587	8 7.328	9 3.860
14.361	7.142	3.724
.226	.186	.136
113		
10 10.417	11 5.631	12 3.260
10.197	5.476	3.143
.220	.155	.117
110		
13 7.716	14 4.136	15 2.311
7.590	4.034	2.235
.126	.102	.076
.063		

1 28.645	2 29.413	3 28.030
28.333	29.144	27.766
.312	.269	.264
267		
45		

66

18.771	4.785	5.772
18.335	4.685	5.685
.436	.110	.087
18.771	4.785	5.772
18.359	4.698	5.685
.412	.087	.087
18.771	4.785	5.772
18.716	4.774	5.745
.055	.021	.023
18.407	4.720	5.713
18.359	4.658	5.695
.048	.022	.018
18.407	4.720	5.713
18.270	4.655	5.658
.137	.065	.055
	130	110
18.771	4.785	5.772
18		

4652 (68
36
1207052
1024
68
560
84

137
137
555
411
137
)18765
)35.6307
4652

K51

24.14.30
17.10.35-
7.3.55-

24.14.50
17.10.10-
7.4

24
168+3 = 171.55-

24.15-.05-
17.11.15-
7.3.50

24.15-.20
17.11.45-
7.3.35-

24.15-.41-
17.12.
7.3.41-

28.333
28.295-
.038

29.144
29.137
.007

27.766
27.718
.048

14.361
14.320
.041

7.142
7.111
.031

3.724
3.692
.032

10.197
10.137
.060

5.476
5.440
.036

7.50
7.466
.024

3.143
3.116
.027

4.034
4.014
.020

2.235-
2.218
.017

1 = 28.295-	2.30	P.M.	Ok-
2 = 29.137	2.35-	"	Ok-
3 = 27.718	2.40	"	[illegible]
7 = 14.320	2.50	"	[illegible]
8 = 7.111	2.55-	"	[illegible]
9 = 3.692	3.	"	"
10 = 10.173	3.05-	"	"
11 = 5.444	3.10	"	"
12 = 3.116	3.15-	"	"
13 = 7.566	3.20	"	Ok-
14 = 3.04	3.25	"	[illegible]
15 = 2.118	3.30		[illegible]
a = 5.113	3.45-	"	Ok-
b = 5.256	3.50	"	Clean
c = 4.987	3.55-	"	"
d = 18.233	4.	"	Ok-
e = 4.60	4.05-	"	Clean
f = 5.634	4.10	"	Ok-
h = 14.277	4.15-	"	Ok-

24

2 4, 25 15
1 9, 21 15

5
24
120

March 4, 1880
12.30 Am.

~~$CuSO_4$, Sp. gr. 1.2, 7.75°~~

~~Large plate 2 x 2, and 2 x 1, small 1/2 x 1/2~~

~~" " 3 in 200 c.c. solution~~

~~2, 17, 4, 5, 6, 7, 8.~~

~~Cu~~ gives a different shade of copper than ~~many~~ the others.

~~Examine had a clear copper on all the plates~~

~~$Cu(NH_4)_2(SO_4)_2$ Sp. gr. 1.14, 7.75° 7.~~

3) 7 7 2
25 7 | 330 (12
25 7
72 Q
3 1 1 1
21 60

1-51

68

12, 3, 16, 17, 18, = 2 x 2 in 200 c.c.
~~4, 5, 6, 7, 8,~~ = 2 x 1 in 250 c.c.
78.9, = 2 x 1/2 " " "
10, 11, 12 = ~~2 x 1~~ 2 x 1 in 100 c.c.
13, 14, 15 = 2 x 1/2 " 50 c.c.

1. 12.30
2. 12.35
3. 12.40
} $CuSO_4$

16. 12.45

17. 12.50
18. 12.55 } $Cu(NH_4)_2(SO_4)_2$

4. "
5. 1.05
6. 1.10
7. 1.15
8. 1.20
9. 1.25
} $CuSO_4$

10. 10.45 A.M.
11. 10.50 "
12. 10.55 "
13. 11 "
14. 11.05 "
15. 11.10 "
} $CuSO_4$

Feb. 5
3. AM

19. 2.0, 21 = 2 x 2 in 250 c.c.
22, 23, 24 = " " "

19. 3. AM.
20. 3.05 "
21. 3.10 "
} $CuSO_4$

22. 3.15
23. 3.20
24. 3.25
} $Cu(NH_4)_2(SO_4)_2$

0-51

Feb. 5

19.57 Pu.
20.5105 "
21.5110 "
} $CuSO_4$

22.5175
23.5120
24.5225
} $Cu(NH_4)_2(SO_4)_2$

3.264 | 19
3.25825
.00575

3.317 | 21
3.31025
.00675

3.252 | 19
3.24225
.00975

3.4045 | 21
3.395
.0095

6.08
5.25
11.33

2.984 | 20
2.97825
.00575

5.75
5.75
6.75
3) 18.25
6.08

3.2545 | 20
3.2445
.0085

5.75
8.5
8.5
3) 22.75
5.25

(6.08

83.25
84.25
83.75
81
4) 332.25
36) 83.06 (2.31
72
110
108
26

60) 2.31.000 (.0385
180
510
480
300
300

10 Bottles.

4 Pumps Calcopyrite.

1 – Sul acid, Equal quantity Coke to Calcopy. place in warm place

2 = ditto place in ordinary temperature,

3 Sul acid – + Copper shavings = [illegible]

4 = Sul acid – [illegible] "

5 Caustic Soda – [illegible]

6 – Bicarbonate [illegible]

7 [illegible]

2.045
1.817
.228

.228) 2.045 (8.969
1.824
2210
2052
1580
1368
2120
2052
68

2.21325
1.966
.24725

~~.24725) 2.21325 (8.969~~
~~2.0~~
~~15325.0~~

2.4725) 2.21325 (8.969
1978.00
23525.0
22260.25
12725.0
12362.25
3525.0
2472.5

8.969
8.969
9) 17.920
8.96

16.65
16.4
.25) 2.055 (8.22
200
55
50
50

13.225
13
.225) 2.213 25 (9.836
1800
825
675
150.0

17.675
17.45
.225) 2.045 (9.09
~~2.0~~
~~0.0~~

Barberry
hornbeam
aspen wood
sycamore
poplar
Firwood.

Vegitable substances pressed between moist clay so that the vapors could escape slowly & [illegible] but 200° & 300° [illegible] resembling Coal = Firwood two stars heated together in a close vessel to 400° yielded a coaly residue black, hard, [illegible] shining, difficult to turn off, carcely any trace of volatile matter when heated.

Charcoal not free from
O & H. Even if heated to
the melting point of platinum

Superheated steam renders
charring more uniform &
causes it to take place at
lower temperature,

Charcoal prepared by Super
steam at 430 has properties
Charcoal prepared without
steam at 1200°

Wood when treated with
aqueous alkalis becomes
less rich in carbon because
incrusting matter is removed
& cellulose remains in a
state of greater or less purity
(paper)

108 : 170 :: 480 : x

170
33600
480

108) 81600 (755.55
756
600
540
600
540
600
540
600

437.5) 755.55 (1.727
437 5
3175
3062 5
1180.0
875 0
3050.0

4.714
4.698
.016

5.707
5.695
.012

144
12
1728

1:3::1728:x
3
5184

81
9
729

2400
1520
8 13
4832

810
3
2430

640
3
1920

64
8
512

5184 (17
300) 4184
270
2430

Ag NO_3

108:170::1:x

108) 170 (1.574
108
620
540
800
756
440
432

49
3
1470

49
7
343

5184 (17
300) 4184
1470
3913
343
171

1:4::64:x
4
256

64

256